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(54) Title: NON-DAIRY ICE CREAM PRODUCT AND METHOD THEREFOR (57) Abstract The present invention relates to a non-dairy dessert composition derived from fruit of the genus <i>Actinidia</i> , and in particular kiwifruit. From the composition can be derived an acceptable ice cream type product which emulates many of the characteristics of dairy based ice creams. Such aerated products, according to the invention, are generally characterised by having relatively stable air-cells which in some embodiments can only be removed by heating the product to near boiling - this generally confers properties of high standability. Another characteristic of most embodiments is that none of the traditional stabilisers used in these types of product have been added, though their addition is an option. The compositions generally comprise a puree-like base material of the <i>Actinidia</i> fruit to which is generally added at least one of a plant-based carbohydrate additive or a sugar. Preferred compositions for ice cream type products incorporate an apple puree material as the carbohydrate additive. It is also preferred to use an <i>Actinidia</i> base material which exhibits thickening when subjected to a shear force, or shear force and aeration.		

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NON-DAIRY ICE CREAM PRODUCT AND METHOD THEREFOR

TECHNICAL FIELD

The present invention relates to the food industry and more particularly, ice cream like dessert products. The present invention includes within its scope embodiments totally
5 absent of animal products. Most embodiments of the present invention are based on a base material derived from kiwifruit or other fruit of the genus *Actinidia*.

BACKGROUND ART

Most ice cream products will fall into four categories, these being:

- i) Ice cream made exclusively from milk products (dairy ice cream);
- 10 ii) Ice cream containing vegetable fats;
- iii) Sherbet ice creams made from fruit juice with added milk fat and milk solids; and
- iv) Ice cream made of water, sugar and fruit concentrate.

The present invention falls within the last category as most embodiments are void of any added vegetable fats or dairy related products. Early products known in this field
15 comprised crushed ice to which flavouring material was subsequently added. More recently other ice cream type products within this category have emerged, such as the dessert of US Patent No. 4,609,561. This describes an aerated juice dessert based on fruit juices but relying upon added stabilisers (gums, carrageenan, etc.) to trap air bubbles so that the product can attain an aerated ice-cream type structure.

20 Ice cream products other than in category (i) above generally seek to fool the palate into believing that the product has the creaminess and texture of a traditional dairy ice cream. While taste perception is subjective, these properties in a dairy ice cream are partly due to the presence of small particles of fats and other components. These appear to exhibit some resilience when compressed against the tongue, as well as providing a lubricating
25 effect which appears to convince the tongue that the product has creamy characteristics. However, such fat cells and globules are not present in the products of category (iv) and thus most products in this category fail to achieve the desirable creamy characteristics of dairy ice creams.

Ice crystal formation can be a problem for many category (iv) products. Ice crystals and
30 needles, once they attain a certain size, become noticeable to the mouth and tongue. Their abrasive nature will tend to counteract any creamy texture characteristics that a product may have. Even a dairy ice cream with a high fat content would not appear creamy if a significant proportion of ice crystals were present.

The specification of US Patent 4,609,561 describes a product which avoids large ice crystals by providing a method for the production of a dessert having very short crystals and a substantially non-lattice structure. However, while this suggests a route to products where detracting elements are removed, it does not generally address the production of a product with creamy characteristics, other than by the addition of stabilisers well-known within the ice cream industry.

A further problem affecting all types of ice cream is standability. Typically most ice cream products are aerated to a certain percentage of overrun, this being the increase in volume attained by aerating a base material. Standability generally refers to the ability of a product to maintain this degree of over run and may vary substantially among different formulations and types of ice cream products. Many products however exhibit relatively poor standability, often succumbing to heat (such as room temperature) to melt or soften and revert to a product with a substantially lesser degree of overrun. This has always been a problem, especially in hotter climates, or where there is inadequate refrigeration. Even when transporting a product, a temporary lapse in refrigeration can cause irreversible damage to most ice cream products.

While the present invention seeks to address some of these problems, it also produces an acceptable food product which is based on kiwifruit and other fruit of the genus *Actinidia*. These are fruits which are typically avoided within the food industry due to the problems associated with their processing. While these fruit have many natural attributes desirable in a food product, they typically undergo a variety of reactions which can significantly degrade the taste and appearance of any product prepared therefrom. Unless a kiwifruit flavoured product is desired, they have not been used since their unique and strong flavour characteristics have been considered too difficult to mask as compared to fruit such as apples. The use of such fruit in a dessert composition is to the applicants, unknown and this is due largely to a reluctance to use such a problematic fruit in a food composition.

It is therefore an object of the present invention to address the problems of the prior art, or at least to provide the public with a useful, alternative choice.

Further aspects of the present invention will now be described by way of example only.

DISCLOSURE OF INVENTION

According to one aspect of the present invention, there is provided a non-dairy based dessert composition comprising a base material, from the fruit of the species *Actinidia*, said composition including at least one of:

- a) an added plant based carbohydrate additive, as herein defined;
- b) an added sweetener, as herein defined;

According to another aspect of the present invention there is provided a non-dairy based dessert composition, substantially as described above, wherein said base composition is of the type exhibiting an increase in viscosity when subjected to a shear force, or shear force and aeration.

- 5 According to another aspect of the present invention there is provided a non-dairy based dessert composition, substantially as described above, having an over run of 40% or greater.

According to a further aspect of the present invention there is provided a non-dairy based dessert composition whose composition comprises, to a total of 100%:

- | | | |
|----|--------|---|
| 10 | 1-40% | soluble and non-soluble fruit solids from fruit of the genus <i>Actinidia</i> ; |
| | 0-50% | soluble and non-soluble fruit solids from other fruit; |
| | 2-30% | sweeteners comprising monosaccharides and polysaccharides; |
| | 25-65% | water; |
| | 0-0.5% | added acidity regulators; |
| 15 | 0-15% | added flavouring agents; |
| | 0-15% | other substances not included above. |

According to yet a further aspect of the present invention there is provided a non-dairy based dessert composition comprising the following components, in parts by volume:

- | | | |
|----|----------|--|
| | 5-60 pbv | a base material derived from fruit of the genus <i>Actinidia</i> ; |
| 20 | 0-80 pbv | an added plant based carbohydrate additive, as herein defined; |
| | 0-20 pbv | an added monosaccharide; |
| | 0-20 pbv | an added non-monosaccharide sweetener |
| | 0-5 pbv | an added stabiliser, as herein defined. |
| | 0-75 pbv | diluent |

- 25 According to an even further aspect of the present invention, there is provided a smooth chilled edible ice-cream product comprising 30-40 parts by weight of a kiwifruit base material having Brix level of 30 to about 45;
the equivalent of 30-50 parts by weight of a puree of a fruit having a solids content of 30% to about 35%;
- 30 25-35 parts by weight of added sugars, and
added fluids to adjust the total solids content, by weight, to within the range of 33-42%, the product being free of added stabilisers, and containing sufficient air incorporated therein to effect an over-run of at least 40%.

According to an even further aspect of the present invention, there is provided a method for the manufacture of non-dairy based dessert composition, comprising the steps of:

- obtaining a base material derived from the fruit of the species *Actinidia*;
- combining with said base material at least one of:
 - 5 a) an added plant based carbohydrate additive, as herein defined;
 - b) an added sweetener, as herein defined.

According to another aspect of the present invention there is provided a method, substantially as described above, comprising subjecting a non-dairy based dessert composition to at least a plurality of the steps of:

- 10 - homogenisation;
- aeration;
- high shearing forces sufficient to achieve an average particle size reduction;
- freezing.

The present invention includes within its scope a non-dairy based dessert composition
15 which can be used in various other food products, as well as a non-dairy ice cream product derived therefrom. Many of the dessert compositions according to the present invention behave as an ice cream precursor, yielding a very acceptable ice cream product after being put through a normal ice cream manufacturing process (typically shearing and aeration).

20 Embodiments of the invention comprise a base material derived from fruit of the genus *Actinidia*. The most commercially exploited member is the kiwifruit (*Actinidia Chinensis*), which will be described in many of the examples herein.

The base material generally comprises a pureed form of the fruit in which insoluble components have a relatively small average particle size. This is typically 1mm or less,
25 or more preferably 0.8mm or less. Larger particle sizes may be tolerated though may detract from the perception of creaminess by the palate, or act as seed sites for ice crystal formation. The base material may be prepared according to acceptable kiwifruit techniques and an acceptable dessert composition, and ice cream product, prepared therefrom. The use of most *Actinidia* fruit, and especially kiwifruit, is such that
30 additional added stabilisers are not required, in contrast to prior art ice cream and dessert manufacturing methods.

Further improvements in the dessert products can be obtained by utilising a viscosity-increasing base composition. This is a base composition, typically as described above, but which has the added and very unusual characteristic of exhibiting an increase in
35 viscosity when subjected to a shearing force or a combination of shearing and aeration. The shearing force is typically equivalent to that applied to material in a vortex mixer, or

processes which result in a reduction of the average (insoluble) particle size of the base composition. The shearing action provided in ice-cream churning may not always be sufficient to result in such an effect, though this is acceptable as any desired thickening may be performed prior to churning processes.

- 5 However the viscosity increasing property does not appear to exist in kiwifruit preparations obtained according to conventional prior art processes and further, does not appear to be a characteristic of compositions obtained from other types of fruit. The present invention will describe one method by which a base composition suitable for use in the present invention can be prepared though the reader is advised that the preparation
10 of such compositions can be found in NZ Patent Application No. 243986 and the ensuing PCT Application derived therefrom.

While these aforementioned base compositions may serve as a useful precursor for soft-serve type ice cream preparations, they are generally unsuitable on their own for the preparation of hard-serve ice cream preparations and in some other types of food
15 products. From research by the applicants, it appears that various other steps and components should be included in a manufacturing process to provide an acceptable product. For instance, it appears necessary to increase the total solid content of a composition in order to produce a satisfactory product such as a hard serve ice cream. However, concentrating and thickening a kiwifruit or *Actinidia* based composition is not
20 always an available solution to the problem. The conditions generally required for concentrating a base composition (derived from the fruit of the species *Actinidia*), which generally requires heating as well as an ensuing concentration of the components in the base composition, tends to destroy the characteristics of a viscosity-increasing base composition used in some embodiments of an ice cream or dessert product. The exact
25 reasons for this are unknown though undoubtedly it is due to problems associated with kiwifruit in the food processing industry. Similarly the flavour characteristics of kiwifruit, unless extensively deodourised and deflavoured, may be too strong to mask in a purely kiwifruit based hard serve ice-cream product which is have another flavour. Further it has been found that a hard serve ice-cream product based purely on a kiwifruit
30 base material is not normally as acceptable as a product according to the present invention. Consequently the applicants have relied upon other methods to address these problems.

Several methods may be used to increase the total solids content (which includes both soluble and insoluble materials) in a dessert composition. Generally this will be by the
35 inclusion of other materials which can increase the solid material present. Typical materials which will be used include the use of sugars (monosaccharides and polysaccharides) and other materials. However, due to the problems associated with

kiwifruit, it is not necessarily a matter of adding sugars to raise the content of solids to the desired level. For instance, sucrose may be included though problems can arise if the sucrose level becomes too high. While the exact cause of these problems (which tend to detract from the creamy nature of at least an ice cream product, though which may not be so noticeable in other products) are not known, the applicants believe that the following effects may be responsible for an inferior product.

It is possible that once the sucrose level surpasses a certain point, inversion may occur. Typically the production of invert sugar from sucrose is acid catalysed. Most members of the species *Actinidia* have high acidity as well as the presence of many other components which have various degrading effects on certain natural products. Consequently it is believed that if the sucrose level reaches a certain point then the nature of the base composition can promote inversion of the sucrose. This will introduce a certain degree of unpredictability into a process as different sugars have different solubilities and levels of sweetness. Consequently if inversion occurs, the sweetness of the resulting dessert composition may not be what was expected.

In addition, it is possible that certain sugars may crystallise from a composition during manufacture or storage and it is possible that this could further act as a seed for the formation of ice crystals. The presence of crystalline substances, unless they are of a very fine nature, it is undesirable as it generally detracts from any creamy characteristics in a product.

It is to be re-emphasised however that the foregoing explanations are currently a theory though the fact remains that the presence of excess sucrose may cause problems in some embodiments of the present invention. Accordingly, it is desirable that the proportion of sucrose in an embodiment (including that naturally occurring in the fruit) is kept to a reasonable level. Due to natural variations in the fruit and base composition, as well as manufacturing techniques, there is no fixed point where problems associated with sucrose occur. However it is generally a recommended guide line that the proportion of sucrose be maintained at less than 30% (of total weight of components) and more preferably less than 25%.

Additional sweetening agents, which can also serve to raise the total solid contents in a dessert composition, can include monosaccharides and sugars unlikely to undergo inversion reactions. However, these also should be sufficiently soluble so as not to crystallise out from the dessert composition or while it is being transformed into another food product. The presence of monosaccharides, especially those which are products from the inversion of sucrose, may also inhibit any sucrose inversion processes.

While sugars are used for raising the solids content in a dessert composition, this alone does not generally yield the best dessert composition according to the present invention. In a dessert composition, according to the present invention, which is to be used for the preparation of a hard-serve ice cream product, the most preferred range of solids is 34-38%. While a reasonable proportion of this value will comprise insoluble fruit solids from the *Actinidia* fruit, substituting the rest purely with sugars may not always be desirable nor yield the best product. Consequently, the present invention also relies upon the inclusion of other solids materials. Typically these materials will comprise insoluble fruit materials and non-sugar carbohydrate material. It is noted however that sugars may be present in any material used to provide either or both of these other sources of solids.

Typical examples of these plant based carbohydrate additives, and which are used in most embodiments of the present invention, are puree type compositions obtained from fruit and plant material other than the fruit of the genus *Actinidia*. Found to be particularly suitable are purees of apple though its suitability is partially economic. Other substantially neutral materials, such as purees and pastes obtained from root materials such as potato etc. may also be used in many embodiments. Typically it is desirable that carbohydrate material introduced is substantially neutral i.e. does not introduce its own strong taste characteristics which will override any attempt to flavour a product, unless of course this is a flavour which is ultimately desired.

In addition, it is often desirable that the added carbohydrate material is substantially colourless and does not react adversely with the components of kiwifruit. Consequently any such source of added plant material (which shall generally be referred to as a plant-based carbohydrate additive, though it may also include non-carbohydrate material) desirably comes from a source which is naturally acidic, as there is generally less chance of adverse reaction with an acidic base composition material. Many fruits such as apples, are naturally acidic and this is likely one reason for the compatibility of apple purees being incorporated into embodiments of the present invention. It is noted however that there have been successful trials with plant-based carbohydrate additives from potatoes.

Another desirable feature of a plant-based carbohydrate additive is that it has a relatively high solid content. As one reason for the inclusion of such material is to increase the solids content in the resulting dessert composition, it is generally desirable that the carbohydrate additive has a reasonably high solid content. Many plant materials, other than the fruit of the genus *Actinidia*, do not show any adverse effects in being concentrated.

Another role of the added plant-based carbohydrate additive is to dilute any *Actinidia* fruit components. This dilution may be useful for reducing catch (a mildly irritating or

unpleasant after-feeling in the throat) in the resulting dessert composition and diluting any remaining *Actinidia* fruit flavour characteristics. In many instances, and including most embodiments of an ice cream product, it is desirable to add some form of flavouring. Typically this may be through the addition of various fruit purees and it is possible that the plant-based carbohydrate additive may provide sufficient flavour. For instance, if any apple flavour product was to be prepared, then the inclusion of an apple based puree may be sufficient. However most products will require additional components to provide the necessary flavouring, colour or other desirable attributes by the user. Components which may be added to a dessert composition include flavourings, colourings, acidifiers, preservatives, flavour enhancers, acid regulators, alkaline agents and other components commonly used within the industry. However, it is noted that generally the use of additional stabiliser is not required. This however is providing that a base material which thickens upon the action of a shearing force or a combination of shearing and aeration, is used in the composition. Typically no additional stabilisers will be required though in some instances or food products, additional stabilisers may be added.

It is noted that while a soft serve ice-cream product may be obtained from a viscosity-increasing base material without the inclusion of a plant-based carbohydrate additive, such a product cannot be obtained unless the *Actinidia* base material exhibits thickening as a result of shear action. In contrast, the present invention provides for an ice-cream and other dessert products which can utilise kiwifruit and *Actinidia* base materials not exhibiting this characteristic. Further, there is no apparent requirement for added stabilisers which are necessary in all the prior art processes. While the exact reasons are unknown, it is considered that according to the method and compositions of the present invention, sufficient stabilising properties are conferred by components of the kiwifruit and *Actinidia* fruit. This may be due to a high level of natural pectins and also the nature of insoluble fruit fibres. Traditional prior art fruit processing techniques appear to adversely affect these or other desirable components in the fruit and this is one considered reason why a base material obtaining according to example 1 herein, or according to the method described in NZ Patent Application No. 243986, will generally provide a superior product. Fruits such as apple, used as a preferred carbohydrate additive, are naturally high in pectins and may contribute to the performance of the product, allowing non viscosity-increasing base compositions to yield an acceptable product. However apple base compositions will not work, there being a requirement to incorporate kiwifruit or *Actinidia* fruit into the process. It is also noted that while successful tests have been conducted with potatoes, instead of apple, apple gave a better product. This suggests that pectins may be desirable in the carbohydrate additive but that other components may also play a role.

The composition which is obtained from the proceeding components may be used as a food product in its own right though will typically be subject to further processing. It is envisaged that a primary end product of the dessert composition obtained thus far would be an ice cream product, though this does preclude other products. To form an ice cream product then the dessert composition is subjected to the standard techniques of ice cream making, which generally comprises churning and cooling, which generally provides a shear force and aeration of the product. The degree of over run in a resulting ice cream type product is largely a matter of user choice and preference though typically an over run of 40% or more. The characteristics of a product thus obtained is generally a very good emulsion of a dairy based ice cream product. While taste is largely subjective, a product can be obtained which is the equal of, if not superior to, other ice cream type products of category (iv).

It may be desirable to cause thickening of the composition before subjecting it to the ice-cream making, or other food product processes. This may be achieved by a shearing force where a viscosity-increasing base material has been used, though it is noted that the shearing force provided during ice-cream churning may not always be sufficient. Consequently a vortex mixer, or another known technique may be used for any desirable thickening of a composition, where appropriate.

A further difference between many embodiments of the present invention and the prior art ice cream type products and dessert compositions is the standability which may be obtained from compositions according to the present invention. Upon aeration, tiny air cells are incorporated into the material. The ability of the material to hold these cells determines the standability of the product. In most dairy and fat based products, the presence of fatty compounds assists in encapsulating and maintaining these air cells although undoubtedly these products rely heavily upon the use of added stabilisers, such as many polysaccharides and cellulose type gums, to maintain these air cells. However, most prior art products will when allows to attain room temperature, soften and melt such that the air cells are freely able to migrate from the product.

In contrast, most embodiments of the present invention, even without the use of added stabilisers, will maintain the presence of a substantial proportion of air cells within an aerated product. Embodiments which have incorporated a viscosity increasing base composition will typically exhibit greater standability. Enhancements to the stability of the entrapped air cells may sometimes be observed by cooling the product, preferably to 0°C or less, during aeration. It is thought that some immobilisation of the air cells and fruit components, thereby allowing greater time for components in the composition to produce a stable envelope about the air cells. Other effects are possible for this often observed effect, especially for where a viscosity-increasing base material has been used.

Most embodiments of the present invention (such as an ice cream product) will soften upon exposure to room temperature but will still retain some shape and a large percentage of the entrapped air cells. This could be a significant advantage for a product and can thus find extensive use in products having substantially reduced refrigeration requirements. However, it is still desirable that most ice cream type products are stored and treated in the same manner as conventional ice creams, where possible.

BEST MODES FOR CARRYING OUT THE INVENTION

Example 1

This example provides a dessert composition which can be subsequently formed into a hard-serve ice cream type product. The non-dairy based dessert of this example comprises a viscosity increasing base material from the fruit of the species *Actinidia*, the composition also including at least one of an added plant based carbohydrate additive (as previously described), and an added sweetener.

For the specific example to be now described a plant-based carbohydrate additive will be included, as this provides for a very acceptable hard-serve ice cream type product. In the example apple is used as the basis of the plant-based carbohydrate additive though as previously mentioned other plant materials may also be used or incorporated.

A. PREPARATION OF BASE MATERIAL

For this example, the base material comprises kiwifruit (from which seeds and skin have been removed) which has been formed into a relatively neutral and odourless based composition. The base is generally prepared by subjecting the fruit to steps which include deodourisation, and comminution to a puree type state having a very fine particle size. Cooking of the fruit may also occur as a separate step in the process though this may occur during deodourisation.

As a summary of the preparation of the base material, the following steps may be followed:

1. Preferably ripe kiwifruit, having a Brix of 13-15, are selected. The fruit having sugar levels outside this range may also be used though this may require some modification of the amounts of added sugars later in the process.
2. The hairs and/or skin of the kiwifruit may now be removed. This step may be deferred, or loose hairs merely removed at this stage.

3. The fruit is then heated though this should not be for an extended period (generally several hours or more) as this can adversely affect the viscosity increasing characteristics of the base material. For example, the whole fruit may be placed in a bath of water in excess of 80°C (typically 92-98°C) for approximately 2-5 minutes or until the fruit has been substantially heated through to its core.

4. The fruit is allowed to stand for a period of time. During this period a substantial proportion of volatile components will escape from the fruit while it also slowly cooks. There is a substantial proportion of residual heat when such heated bulk fruit are placed in a vat. Generally the fruit are allowed to stand for a period of 20-40 minutes.

5. The fruit is now comminuted to produce a puree. If the skins have not been previously removed then this may be done at this stage. Typically comminution may be performed in fruit-finishing apparatus which extrudes the kiwifruit flesh through a screen. The size of the screen (typically 0.8-1.0 mm or smaller) is generally sufficient to also remove the seed from the extruded puree.

It is preferable that sufficient comminuting of the fruit is achieved so that the resulting puree is substantially homogenous and has a relatively small particle size. The presence of larger particles can detract from a smooth and creamy perception by the palate and thus if necessary, further shearing or comminution of the pulp may be performed so that the particle size is sufficiently small to produce a puree which can yield a dessert composition pleasing to the tongue. However, an ultra fine size need not be obtained in all circumstances as shearing (which further reduces particle size) may be performed at the later stages in the preparation of the dessert composition. It is also noted that excessive shearing through homogenisation may also increase the viscosity of the puree to an unacceptable degree.

6. The puree obtained thus far may now be passed through deodourising apparatus to remove any remaining, or a substantial proportion of remaining volatile aroma/flavour constituents. This step is optional but recommended if a relatively neutral base composition which can be subsequently flavoured is to be obtained. Care should be taken that excessive periods of prolonged heating of the puree are avoided as this will not usually yield a viscosity-increasing base material. If this is the case then an acceptable ice cream product will normally still be obtainable though it may be of a lesser quality. It is noted that if a concentration step to concentrate the base material is to be included, then it should be performed as

quickly as possible (e.g. high temperature for a short duration) otherwise the viscosity increasing characteristics of the base composition may be adversely affected.

- 5 7. The base composition obtained thus far is generally suitable for use in a dessert composition. However, further optional steps may be performed. These include decolourisation of the puree according to the standard techniques. This may occur during deodourisation of the puree or at other stages in the process. Again care should be taken to avoid degradation of the components of the puree based material which allow for thickening of a subsequent dessert product.
- 10 8. Another optional step is to pasteurise, sterilise, UHT treat or otherwise treat the base material to inhibit the growth of micro flora etc. This may obviate any need to refrigerate the product in storage or transportation.
- 15 9. Another optional step is to alter the pH of the base material. Kiwifruit is highly acidic and thus it may be desirable to slightly raise the pH. In some instances the pH may have altered as a result of the process preparing a base composition, and thus components which restore the pH of the base material close to that of the natural fruit may be incorporated. Various chemicals may also be added to raise the pH.
- 20 10. Sugars and sweeteners may also be included in the preparation of the base composition, though as these will generally be added in the method for preparing a dessert composition according to the present example, the inclusion of sugars into the base composition will not be discussed in detail here.

B. SWEETENING AGENTS/SUGARS

25 The preferred sugars used may include sucrose, fructose and maltodextrin. Other sugars may also be used, including artificial sweeteners, though typically the sugar or sweetening agent will comprise a monosaccharide and/or polysaccharide.

30 The quantity of sugar requires may be influenced by the Brix of the kiwifruit used in the base material whether any sugars have been added during its preparation. A sweetening agent such as a sugar for the present composition will typically comprise from between 2-30% by weight in the resulting composition. Sugars may be used to increase the total solids content though some solids will also be provided by the plant-based carbohydrate additive. Sugars may also play a further role as there is a relationship between pectins and sucrose (and other sugars) which can enhance or affect the setting ability of the pectin substances present in the base material, and perhaps in the carbohydrate additive.

Very sweet substances such as saccharin, cyclamate, and protein based sweetening agents such as aspartame, thaumatin and monellin appear not to be as effective in the present invention though may be incorporated where it is desirable to perform adjustments to the total solids in a resulting dessert composition e.g. to reduce the amount of sugars so that the proportion of plant-based carbohydrate additive can be increased (so as to increase the amount of plant fibre etc.).

Another consideration is that some sugars have different degrees of solubility and are more likely to crystallise (thereby detracting from the creamy texture of the product). For instance, sucrose may under some circumstances form inversion products which can alter the characteristics of a resulting product. Consequently, it is usually desirable not to rely on sucrose as the sole sugar in various embodiments, especially where a high proportion of sugar is present. In a preferred embodiment maltodextrin is present from 1-28% by weight whereas other sugars such as sucrose, can make up the balance of the added sugars. Some examples will be provided later within this specification.

15 C. PLANT-BASE CARBOHYDRATE ADDITIVE

Generally this is a puree type composition which can be used to increase the total solid content of a composition. A commercial puree based on apple, having a relatively fine fibre size may be used. Fibres which are of a size which can detract from the feeling of creaminess to the palate are generally best omitted from an added carbohydrate material. Typically this will involve screening or filtering large particles from the added material or performing further comminution and shearing to reduce the average particle size.

Ideally the added plant-base carbohydrate material will be substantially free of its own flavours, colours or odours, unless it is desirable to include these features for flavouring of the final product. In many respects, the requirements for an added plant-base carbohydrate material are similar to the requirements for the base composition. Plant material (e.g. apples) containing pectins may be advantageous in augmenting the pectins normally present in the base material. This may increase the standability of some aerated embodiments and is also preferable where non viscosity-increasing base materials are used.

As it is generally desirable not to subject the *Actinidia* base material to concentration steps (when a viscosity increasing base material is required), the added plant-base carbohydrate material is one manner in which the total solid content percentage can be raised in a dessert composition. Apple and many other materials which can be used in the preparation of a carbohydrate additive are not susceptible to the problems of kiwifruit and

thus a range of solid percentages can be obtained which will give the user greater flexibility in the preparation of a dessert composition according to the present invention.

D. STABILISERS

- 5 Stabilisers may be used to assist in proving the viscosity of the composition. However the base material will generally provide a sufficient stabiliser type effect to preclude the general addition of stabilisers in most embodiments. At least for a hard-serve ice cream product no added stabilisers are generally required though for specialised products, stabilisers generally acceptable to the food industry may be included.

E. ADDED LIQUID

- 10 Liquid may be incorporated into a composition to help vary the total solid content. Quite often water will be the added liquid though fruit juices and concentrates may also be included, especially where these also provide a flavouring affect for the resulting composition. Various components to be included in a dessert composition may be incorporated into the liquid before its inclusion.

15 F. OTHER ADDITIONS

Dessert compositions can also include a number of optional ingredients. Typically these will be substances which increase the appeal to the palate or the visual appeal of the product. These may include, for example, flavouring, colouring, acidulents, nuts, vitamins, preservatives, texture altering substances, spices, pieces of fruit and such like.

20 G. COMPOSITION PREPARATION

The specific content of compositions according to the present invention may vary. One example is a non-dairy based dessert composition whose composition comprises, to a total of 100%, by weight:

- | | | |
|----|--------|---|
| | 1-40% | non-soluble fruit solids from fruit of the species <i>Actinidia</i> ; |
| 25 | 0-50% | non-soluble fruit solids from other fruits (as herein defined); |
| | 2-30% | sweeteners comprising monosaccharides and polysaccharides; |
| | 25-65% | water; |
| | 0-0.5% | added acidity regulators; |
| | 0-5% | added flavouring agents; |
| 30 | 0-15% | other substances not included above. |

The above composition may include 2-15% monosaccharides, which have either been added or present in the various components.

Another dessert composition according to the present invention has been formed from combining the following components, in parts by volume:

- | | | |
|---|------|---|
| | 5-60 | a 40 Brix equivalent base material, as herein defined, from fruit of the species <i>Actinidia</i> ; |
| 5 | 0-80 | an added plant based carbohydrate additive, as herein defined; |
| | 0-20 | an added monosaccharide; |
| | 0-20 | an added non-monosaccharide sweetener |
| | 0-5 | an added stabiliser, as herein defined. |
| | 0-75 | diluent. |

10 Typically the above compositions will have a total solid content from 10-60% inclusive. Where the composition has to be formed into a hard-serve ice cream product, the range will generally be restricted to 30-45%. Satisfactory hard serve ice cream products prepared according to the present invention have generally fallen within the range 34-38% inclusive though values outside of this range will also be commonly encountered.

15 The compositions according to example 1 are typically also further characterised in that they will often contain 30-50% inclusive, of the base material from the fruit of the species *Actinidia*. This percentage will typically be for a 15 Brix equivalent based material (i.e. its solids content resembles that of a normal 15 Brix ripe kiwifruit or the appropriate *Actinidia* fruit – e.g. a 45 Brix base can be diluted with 2 parts of water to yield a 15 Brix equivalent). Typically the same embodiment will also comprise 30-50% of an added plant-based carbohydrate additive, this also being at a 15 Brix equivalent.

The embodiments of example 1 will typically also be further characterised in that their sugar level will typically exceed 25 Brix though sugar levels are generally a matter of individual taste and thus the market will undoubtedly influence the sugar content.

25 However sugars are generally present in the fruit and other material used within the composition, and certain sugars can sometimes enhance the performance of pectins present in the base material as stabilisers. Consequently a sugar level of 25 Brix or more is generally recommended for most embodiments.

30 The proportion of sucrose to monosaccharides can vary though to avoid possible inversion which may in some instances adversely affect the performance of a product, the proportion of sucrose to monosaccharides (total percentage by weight within a composition) is generally 50% or less.

To prepare a composition according to example 1, the required proportion of base material is selected. If a flavoured product is to be made then ideally as much flavour and odour has been removed from the base composition during its preparation as possible.

However during trials residual kiwifruit flavour has been found to enhance many fruit flavours.

To the base material is blended the required proportions of an apple puree. This is may be a commercially available product, commonly supplied at approximately 40 Brix. If a product having exemplary creamy characteristics is required then further screening and comminution may be performed at this stage to further reduce the size of any insoluble components, which are typically fruit fibres. Typically this will mean a size of less than 0.8mm and more preferably less than 0.2mm. However, taste is very subjective and thus trials and food tasting are recommended for fine tuning a process for producing a composition.

Sugars are also incorporated into the materials and thus are blended although it may be desirable to pre-dissolve these into any added liquids if required. These liquids may include water and other diluents, liquid sweetening agents and fruit juices used for flavouring.

Flavourings may rely predominantly upon fruit juices though purees may also be incorporated. For example 1-30% (typically 10-20% – of total composition by weight) of a strawberry pulp or puree may be included as a flavouring agent. Proportions may vary outside of this range for different fruits and according to the taste requirement for a particular market. Pieces of whole fruit may also be blended though if an ice cream product is to be prepared, then large pieces may be best incorporated after any ice cream churning process.

A dessert composition obtained thus far may then be used as a base for other products, see example 2.

Example 2

A dessert composition obtained by a process similar to example 1 may be used in the production of a variety of food products. Preparation of an ice cream product is described in example 3 though the dessert composition may be used in the production of other food products. For instance a mayonnaise type product can be produced though typically the solid content will vary from that described in Example 1 which is being optimised for an ice cream product. However a wide variety of consistencies of mayonnaises are possible and the solids content, as well the proportion of base material and its thickening ability, will influence the solid content of the product. It is also noted that for high viscosity products such as mayonnaises, it is necessary to use a viscosity increasing base material. There may therefore be a dependency on a homogenising or shearing step, during which aeration may occur, to produce the necessary thickening.

Typically for a mayonnaise there is less desire for a sweet product thus the proportion of sugars included or present may be reduced. This places increased dependence on the base material and the plant based carbohydrate additive to provide the required solids content.

- 5 The fruity flavour characteristics from the incorporated components may not always be desirable in all mayonnaises and thus a higher degree of deodourisation of the base material may be performed. Similarly the plant-based carbohydrate material can also introduce taste characteristics. Consequently it may be desirable to use plant-based carbohydrate additives which have been subjected to a high level of deodourisation and/or flavour. Alternatively, materials having a substantially complimentary (to the product) taste, or very little taste at all, can be included. For instance potatoes and other root crops could be considered as the main plant source for the carbohydrate additive. Nuts may also be considered and the flavour characteristics they provide can be very complimentary to many foodstuffs for which mayonnaises are used. The plant oil content of many nuts may also be desirable as many mayonnaise products also include an oil. As can be seen there is a wide scope for use of the present invention in the preparation of products such as a mayonnaise, and due to a wide range in mayonnaises which are typically produced, there is room for a considerable variation of a formulation using the present invention. Perhaps the main potentially realisable advantage is that a mayonnaise can be produced which is substantially void of dairy products though can readily simulate many of the characteristics of dairy-based mayonnaises.

- Another possible food product obtained from a dessert composition from a process such as described in Example 1, are baked products (cakes and loafs) in which the composition has substituted or partially substituted components such as cream, butter and eggs. Again the ability of the present invention to emulate the creamy characteristics of the dairy product can also help produce a product which emulates these substances.

Fruit aerosols are another possible food product those these will be dependent upon the used of a viscosity increasing base material.

Example 3

- 30 Example 3 describes the preparation of a hard-serve ice cream product from a dessert composition such as may be prepared according to Example 1. A commercially available kiwifruit puree may also be used, though the result is not as satisfactory as for viscosity-increasing base materials. A soft-serve composition could also be prepared in a manner of that described for the hard-serve formulation. However it is generally typical that soft-serve formulations will have a lower solid content. For example, in trials performed by the applicant a typical hard-serve formulation often had a solid content within the range of

34-38% whereas a soft-serve formulation was typically in the range of 32-36%. However it is noted that these percentages are by way of example only and indicate what is likely to be the norm rather than being restrictive limits for particular products.

In particular a hard-serve ice cream product according to the present invention had a total solids content of between 34-38%. Its composition comprises:

20-30pbw	kiwifruit base material
12-20pbw	apple puree
4-10pbw	maltodextrin
20-30pbw	sucrose
10 0-5pbw	other fruit material for flavouring (puree or pulped)
0-2pbw	stabilisers
0-2pbw	flavouring compositions
- pbw	water or liquids to attain desired total solid content

The composition from above, which has been prepared in accordance with the present invention, is then subjected to a typical ice cream making process, in the manner of a normal dairy-based ice cream precursor. Generally this involves churning and cooling which in physical terms on the composition generally means some shearing of the composition as well as aeration. The combination of the two gives rise to thickening of the product in the eventual formation of an ice cream product, though most of this thickening is a result of freezing rather than viscosity increases through shearing. Typically cooling is required as the ice cream process generally requires some ice crystal formation though the ice crystals formed in most embodiments of the present invention are relatively small and undetectable to the tongue. As the size of the ice crystals can also be influenced by the ice cream making procedure, conditions which minimise the size of formed ice crystals should generally be performed, however, existing ice cream making techniques can generally be applied to the dessert composition to provide an acceptable ice cream type product.

Over run is generally performed to a level exceeding 10% though for an ice cream product over run of 40% or greater will generally be performed. A typical range for a hard serve product is 40-120%.

The result is generally a hard-serve ice cream product (unless the conditions have been optimised for a soft-serve formulation). The product is generally characterised by having a large number of air cells trapped within the product as a result of the aeration process. In trials performed by the applicant, these air cells tend to be relatively more uniform in size than many dairy based ice cream products. It is possible that this helps create the

illusion of creaminess to the palate of a user and thus the creaminess in many of the dessert composition according to the present invention will generally be enhanced by aeration of the product. Many food products, including mayonnaises discussed in Example 2, can be aerated if it is required to further promote the illusion of creaminess in the product.

Another characteristic of many aerated products according to the present invention is that the air cells are relatively stable, and often more stable than a comparable dairy product. Many products according to the present invention show a high degree of standability and in some cases boiling of the product may be required to destroy the air cells in a product. Consequently many products contained in accordance with the present invention may find a reduced need for refrigeration or better preservation of the characteristics at room temperature. In comparison to a hard-serve ice cream product with a dairy based ice cream product, both left at room temperature, the dairy based product eventually melted and ran losing a significant proportion of its entrapped air cells. Further re-cooling was unable to produce an ice cream product resembling the original. In contrast, the hard-serve formulation merely slumped but retained a substantial proportion of its air cells so that even after the dairy ice cream product was substantially melted, the non-dairy based product still tasted like an ice cream product. Consequently there are potentially realisable advantages here which would be apparent to a skilled addressee of the art in the light of the description given herein. For example, in a mayonnaise product there may be less tendency for separation or thinning of the product. The composition may also find use as an improved thickening agent in existing food products.

Example 4

This example may make use of a base composition processed according to normal known techniques or a base composition according to a method such as described in Example 1 herein. In the following examples the base composition is a 40 Brix equivalent (typically containing approximately 45% total solid content), though a Brix level of 30 to 45 is usually acceptable. The apple puree used as the carbohydrate additive is approximately 38 Brix (typically comprising 30-35% total solid content). Ideally the added fruit puree should have 25% solid content or greater. The particle size is ideally sufficient to pass through a 0.8mm screen or smaller. Other concentrations of these components may be used though the proportions included will need to be recalculated, typically based on the Brix value or solids content.

The composition will typically comprise:

30-40pbw	40 Brix equivalent kiwifruit puree
30-50pbw	apple puree
25-35pbw	sugars

- 5 To the above components will be added liquids to adjust the total solids content to 33-42%, or more preferably 33-38%. The added liquids may include water, or fruit juices which can introduce flavour. Purees of other fruits may also be included as flavouring agents. Spices, colouring agents, flavours, flavour enhancers and other optional ingredients may also be included.
- 10 The sugars may comprise sucrose and a monosaccharide such as maltodextrin. Ideally at least 20% of the added sugars are monosaccharides.

- The resulting composition is then subjected to a normal process for making an ice cream or frozen yoghurt product. Typically aeration is sufficient to provide a product with an over run of exceeding 40%, and typically 40-120%. The result is a hard-serve type ice
- 15 cream product.

Example 5

- A substantially dried product may also be prepared which can be reconstituted in subsequent processes. Typically a dessert composition is dried according to known techniques, and will exhibit most of its properties upon reconstitution. Freeze-drying has
- 20 been successfully tested by the applicant, and it is envisaged that spray drying and roller drying will be equally as successful.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof as defined in the appended claims.

THE CLAIMS DEFINING THE INVENTION ARE:

1. A non-dairy based dessert composition comprising a base material derived from the fruit of the genus *Actinidia*, said composition including at least one of:
 - a) an added plant based carbohydrate additive, as herein defined;
 - b) an added sweetener, as herein defined;
2. A non-dairy based dessert composition as claimed in claim 1 in which said base material is of the type exhibiting an increase in viscosity when subjected to a shear force, or shear force and aeration.
3. A non-dairy based dessert composition as claimed in claim 1 having a total solids content of 10-60% inclusive.
4. A non-dairy based dessert composition as claimed in claim 1 having a total solids content of 30-45% inclusive.
5. A non-dairy based dessert composition as claimed in claim 1 having a viscosity exceeding 2500 cp at 20°C.
6. A non-dairy based dessert composition as claimed in any one of claims 1 through 5 which includes at least one of:
 - an added flavouring agent;
 - an added colouring agent;
 - an added diluent;
 - an added extender.
7. A non-dairy based dessert composition as claimed in any one of claims 1 through 5 in which a plant based carbohydrate additive comprises a fruit puree.
8. A non-dairy based dessert composition as claimed in claim 7 which comprises a puree derived from apples.
9. A non-dairy based dessert composition as claimed in any one of claims 1 through 5 in which said plant based carbohydrate additive has a sugar level exceeding 30 Brix.
10. A non-dairy based dessert composition as claimed in any one of claims 1 through 5 in which said plant based carbohydrate additive has a total solids content exceeding 25% by weight.
11. A non-dairy based dessert composition as claimed in any one of claims 1 through 5 in which said added sweetener includes a mono-saccharide.

12. A non-dairy based dessert composition as claimed in claim 11 in which said added sweetener comprises maltodextrin.
13. A non-dairy based dessert composition as claimed in claim 11 in which the amount of mono-saccharides present in said composition exceeds the amount of sucrose present.
14. A non-dairy based dessert composition as claimed in any one of claims 1 through 5 which includes an added stabiliser comprises at least one of the group of: pectins, polysaccharide gums, agars, gelatines, and acid-stable food grade stabilisers.
15. A non-dairy based ice-cream product from a composition as claimed in any one of claims 1 through 5 aerated to 40% over-run or greater.
16. A non-dairy based ice-cream product from a composition as claimed in claim 15 cooled to 0°C or lower during aeration.
17. A non-dairy based dessert composition whose composition comprises, to a total of 100%:
 - 1-40% soluble and non-soluble fruit solids from fruit of the genus *Actinidia*;
 - 0-50% soluble and non-soluble fruit solids from other fruit;
 - 2-30% sweeteners comprising monosaccharides and polysaccharides;
 - 25-65% water;
 - 0-0.5% added acidity regulators;
 - 0-15% added flavouring agents;
 - 0-15% other substances not included above.
18. A non-dairy based dessert composition as claimed in claim 13 which includes maltodextrin.
19. A non-dairy based dessert composition as claimed in claim 17 aerated to 40% over-run or greater.
20. A non-dairy based dessert composition comprising the following components, in parts by volume (pbv):
 - 5-60 pbv a base material derived from fruit of the genus *Actinidia*;
 - 0-80 pbv an added plant based carbohydrate additive, as herein defined;
 - 0-20 pbv an added monosaccharide;
 - 0-20 pbv an added non-monosaccharide sweetener
 - 0-5 pbv an added stabiliser, as herein defined.
 - 0-75 pbv diluent

21. A non-dairy dessert composition as claimed in claim 20 having a total solids content of from 30-45% inclusive.
22. A non-dairy based dessert composition as claimed in claim 20 in which said base material is of the type exhibiting an increase in viscosity when subjected to a shear force, or shear force and aeration.
23. A non-dairy dessert composition as claimed in claim 20 in which at least 20pbv of added sweeteners, comprising added mono-saccharides and non-monosaccharide sweeteners.
24. A non-dairy based dessert composition as claimed in any one of claims 20 through 23 aerated to 40% over-run or greater.
25. A non-dairy based dessert composition as claimed in claim 24 wherein said non-dairy composition has been subjected to at least one of:
 - homogenisation;
 - high shearing forces sufficient to achieve an average particle size reduction;
 - freezing.
26. A smooth chilled edible ice-cream product comprising 30-40 parts by weight of a kiwifruit base material having Brix level of 30 to about 45;
the equivalent of 30-50 parts by weight of a puree of a fruit having a solids content of 30% to about 35%;
25-35 parts by weight of added sugars, and
added fluids to adjust the total solids content, by weight, to within the range of 33-42%,
the product being free of added stabilisers, and containing sufficient air incorporated therein to effect an over-run of at least 40%.
27. A product as claimed in claim 26 in which insoluble particles will pass through a screen of 0.8mm.
28. A method for the manufacture of non-dairy based dessert composition, comprising the steps of:
 - obtaining a base material derived from the fruit of the species *Actinidia*;
 - combining with said base material at least one of:
 - a) an added plant based carbohydrate additive, as herein defined;
 - b) an added sweetener, as herein defined.

29. A method as claimed in claim 28 in which preparation of a base material comprises steps of:
- skin removal;
 - heating of fruit to at least the equivalent of 2 minutes immersion in an 80°C water bath;
 - allowing the fruit to stand after heating;
 - comminution of the fruit.
30. A method as claimed in claim 28 in which preparation of a base material also comprises at least one of the steps of:
- decolourisation;
 - deodourisation;
 - alteration of the pH;
 - filtering or straining to remove seed, hair and skin material which may be present.
31. A method as claimed in claim 28 in which the base material is of the type exhibiting an increase in viscosity when subjected to a shear force, or shear force and aeration.
32. A method as claimed in claim 28 in which the proportions of components have been selected to yield a product having a total solids content of from 10-60% inclusive.
33. A method as claimed in claim 32 in which the proportions of components have been selected to yield a product having a total solids content of from 30-45% inclusive.
34. A method as claimed in any one of claims 28 through 31 in which there are sufficient included sweetening agents for the combined monosaccharide and polysaccharide content, by weight, of the composition to exceed 20%.
35. A method as claimed in any one of claims 28 through 31 which includes a heat treatment step.
36. A method as claimed in claim 35 in which said heat treatment comprises a UHT or pasteurisation step.
37. A method for the preparation of a non-dairy based ice-cream dessert composition comprising subjecting a non-dairy based dessert composition from a method as claimed in any one of claims 28 through 32 to aeration and at least one of the steps of:
- homogenisation;
 - high shearing forces sufficient to achieve an average particle size reduction;
 - freezing.

38. A method for the preparation of an non-dairy based ice-cream dessert composition as claimed in claim 37, in which the composition has been aerated to an over-run of 40% or greater.
39. A non-dairy ice-cream dessert composition according to a method as claimed in claim 38.
40. A non-dairy based dessert composition, substantially as described herein with reference to the contained examples.
41. An ice-cream product, substantially as described herein with reference to the contained examples.
42. A method for the manufacture of non-dairy based dessert composition, substantially as described herein with reference to the contained examples.

INTERNATIONAL SEARCH REPORT

Inter. Appl. No.

PCT/NZ 93/00069

A. CLASSIFICATION OF SUBJECT MATTER

IPC 5 A23L1/064 A23L1/212 A23G9/02 A23G9/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 5 A23L A23G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,5 089 285 (HISASHI NOSAKI ET AL.) 18 February 1992 see column 4, line 26 - line 36 see column 4, line 49 - line 66; claims 1,8-10 ---	1,2,17, 20,22
X A	WO,A,91 03172 (JOHNSON R. L. ET AL.) 21 March 1991 see page 6, line 14 - line 27; claims; examples --- -/--	1,2,28, 37,41,42 9,11,15, 16,26

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
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INTERNATIONAL SEARCH REPORT

International Application No

PCT/NZ 93/00069

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Inter. .nal Application No

PCT/NZ 93/00069

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